MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2017/2018

PAM0135 –ALGEBRA

(Foundation in Information Technology / Life Sciences)

11 OCTOBER 2017
2.30 P.M – 4.30 P.M
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **TWO** pages excluding the cover page and the Appendix.

2. Answer **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the Answer Booklet provided.

4. All necessary working steps **MUST** be shown.

Instruction: Answer **ALL** questions.

Question 1 [10 marks]

Solve the equations:

a. $2x^4 - 11x^2 - 63 = 0$ (4 marks)

b. $\sqrt{3-2\sqrt{x}} = \sqrt{x}$ (4 marks)

c. $\frac{2x-3}{5} + 2 \leq \frac{x}{2}$ (2 marks)

Question 2 [10 marks]

Given the quadratic function $f(x) = -4x^2 + 4x$.

a. Find the vertex, the x-intercepts, the y-intercept, and the axis of symmetry of the graph of f. (5 marks)

b. Sketch the graph of $y = f(x)$. Show clearly the vertex, the x-intercepts, the y-intercept, and the axis of symmetry on the graph. (3 marks)

c. Determine the domain and the range of $f(x)$. (1 mark)

d. Determine the intervals where f is increasing or decreasing. (1 mark)

Question 3 [10 marks]

a. Given the function $g(x) = \sqrt{1-4x}$. Find the inverse function $g^{-1}(x)$. (2 marks)

b. Given the polynomial function. $f(x) = x^4 + x^3 - 3x^2 - x + 2$

i. Using the Factor Theorem, show that $(x+2)$ and $(x+1)$ are factors of f. (1 mark)

ii. Factorize $f(x)$ completely, and solve the equation $f(x) = 0$. (3 marks)

c. Solve the equations:

i. $4^{2x-1} = 6^{x+2}$ (2 marks)

ii. $\left(e^4\right)^x . e^{x^2} = e^{12}$ (2 marks)

Continued...

Question 4 [10 marks]

a. Use mathematical induction to prove that

$$1+3+5+...+(n+2)=n^2$$

for all positive integers n. (4 marks)

b. Use the Binomial Theorem to expand $(x^2+x+1)^3$ and express the result in simplified form. [Hint: Write (x^2+x+1) as $x^2+(x+1)$] (4 marks)

c. Find the fourth term in the expansion of $(3x+y)^{10}$. (2 marks)

Question 5 [10 marks]

a. Find the first four terms of the sequence in which $a_1 = 3$ and $a_n = 4a_{n-1}$ for $n \geq 2$. (2 marks)

b. Given the first four terms of an arithmetic sequence: 7, 22, x, 52,...

i. Find the common difference, d and the value of x. (1 mark)

ii. Find the 20^{th} term. (1 mark)

iii. Find the sum of the first 20^{th} term. (1 mark)

c. Find the sum of the geometric series 6, 12, 24, ..., 1536. (5 marks)

End of Paper

APPENDIX

$a^2 - b^2 = (a-b)(a+b)$

$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$

$a^3 - b^3 = (a-b)(a^2 + ab + b^2)$

$(a+b)^2 = a^2 + 2ab + b^2$

$(a-b)^2 = a^2 - 2ab + b^2$

$(a-b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$

$(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$

$\log_b b = 1$

$\log_b 1 = 0$

$\log_b (MN) = \log_b M + \log_b N$

$\log_b \left(\frac{M}{N}\right) = \log_b M - \log_b N$

$\log_b M^p = p \log_b M$

$\log_b M = \frac{\log_a M}{\log_a b}$

$a_n = a_1 + (n-1)d$

$a_n = a_1 r^{n-1}$

$S_n = \frac{n}{2}(2a_1 + (n-1)d) = \frac{n}{2}(a_1 + a_n)$

$S_n = \frac{a_1(1-r^n)}{1-r}$

$S = \frac{a_1}{1-r}$, infinite sum $|r| < 1$